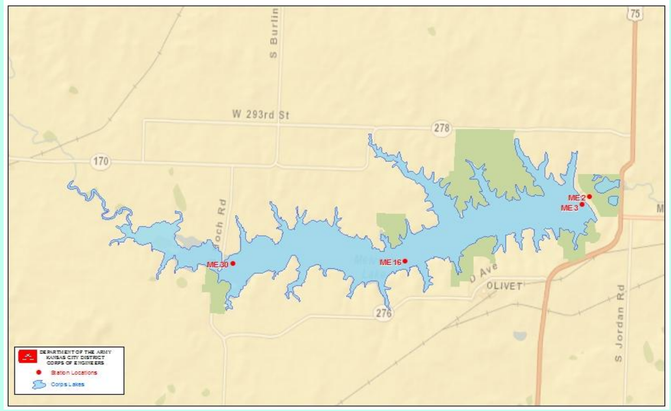
Melvern Lake Water Quality Data

2005-2014

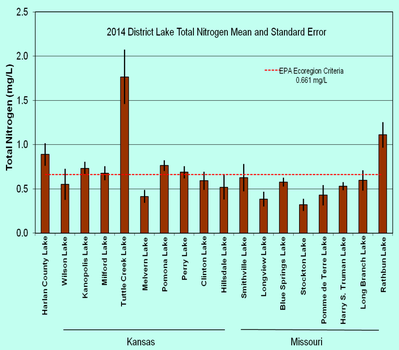


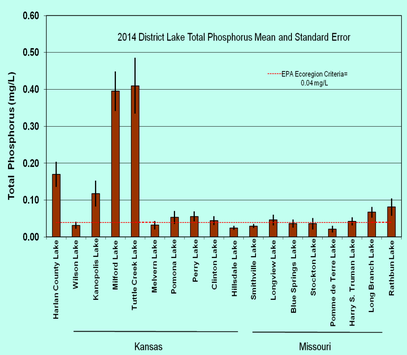
Melvern Lake

- Built on Marais des Cygnes River reaching multipurpose pool in 1975.
- **Watershed** = 349 square miles/ 223,360 Surface Acres (SA)
- **Capacity (2009 sediment survey)**:
  - Flood Control: 209,005 Acre-feet (AF) / 14,010 SA
  - Multipurpose: 149,630 AF / 6,951 SA / 101 miles of shoreline
  - Multipurpose pool sediment reserve: 12,630 AF
  - Avg. annual inflow (2005-2014)= 147,133 AF; 2014 inflow=58,241 AF
- **Operating project purposes**: flood control, water quality, recreation, fish and wildlife, and water supply
- **Water Quality** at Melvern Lake in 2014 was beneficial to operating purposes listed above and did not exceed KS State WQ Standards for designated uses. Water quality improves as nutrients, herbicides and sediments are removed by settling, dilution, and biological processes as water moves from inflow streams to the dam.

Nutrient enrichment

Nutrients (i.e. phosphorus and nitrogen) are essential for aquatic life and are the primary factor driving fish and aquatic plant growth rates and productivity. Excess nutrients from urban, agricultural or natural sources increases the natural aging or eutrophication process in lakes. This can alter plant and aquatic life in lakes and water bodies, cause algal blooms, and create low dissolved oxygen. Melvern Lake inflow in 2014 was 60% less than 10-year average which lead to reduced nutrient and sediments transported to Melvern Lake. Melvern Lake was below average for Kansas City District Lakes for average total phosphorus (0.094 mg/L) and total nitrogen (0.68 mg/L) measured at the site nearest the dam. Total phosphorus sampled at the dam (ME-3) was less than EPA Ecoregion recommended criteria and in the range of moderate productivity or mesotrophic according to Carlson Trophic Classification. Standard error bars in the graphs below illustrate the variation in sample results from each site in 2014.



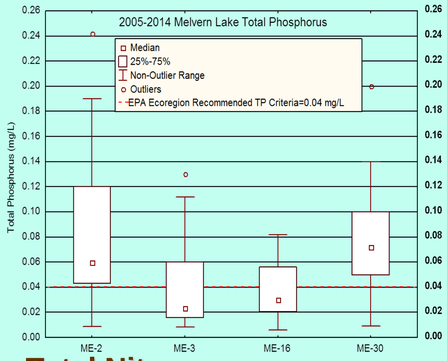


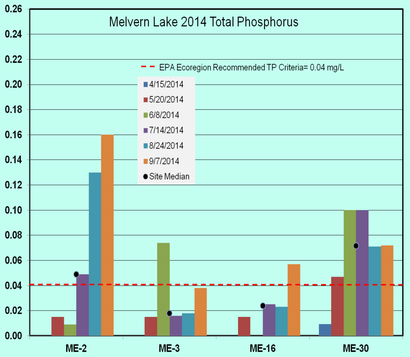
The US Army Corps of Engineers (USACE) Water Quality Program collects monthly water samples at Melvern Lake* from April through September. These figures present data collected between 2005-2014 from lake sites (#3,16, 30), and the outflow (#2) below the dam. Thirty-four chemical, physical and biological parameters are measured to evaluate water quality. USACE uses this data to describe water quality history, conditions and changes from the inflow streams, within the main lake, and outflow focusing on eutrophication, nutrients, sediment, herbicides, metals, and contaminants.

*Note: The term "lake" is substituted for technically correct "reservoir" throughout this document for consistency.

Total Phosphorus

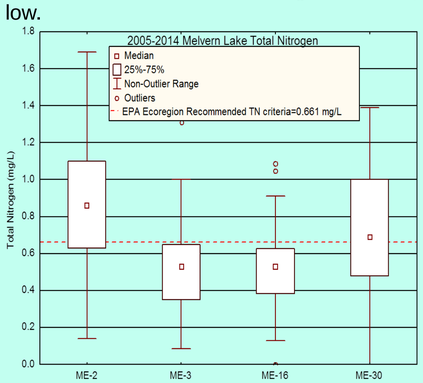
Total phosphorus (TP) median concentrations from 2014 Melvern Lake samples were lower than 10-year TP medians and below EPA Ecoregion recommended criteria (0.04 mg/L) at lower lake sites ME-3 and ME-16. In 2014, summer median TP at Lake sites are in the range of moderate biological productivity indicative of moderate population of beneficial algae species and moderate fish growth rates in the mesotrophic classification of Carlson's Tropic Status Index. Similar to most impoundments, higher TP concentrations and a wider range of data is usually found in the upper lake sites due to influences from inflow streams and biological uptake or utilization of TP as the water moves through the lake to the dam. This process is evident in graphs below as phosphorus concentrations decrease from upper lake (ME-30) to the dam (ME-3).

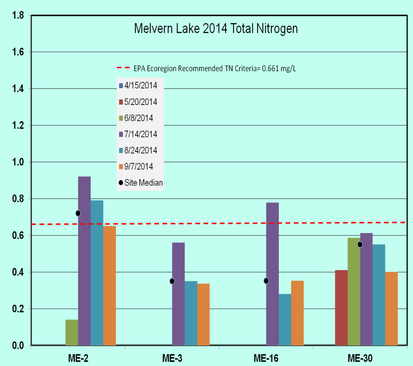




Total Nitrogen

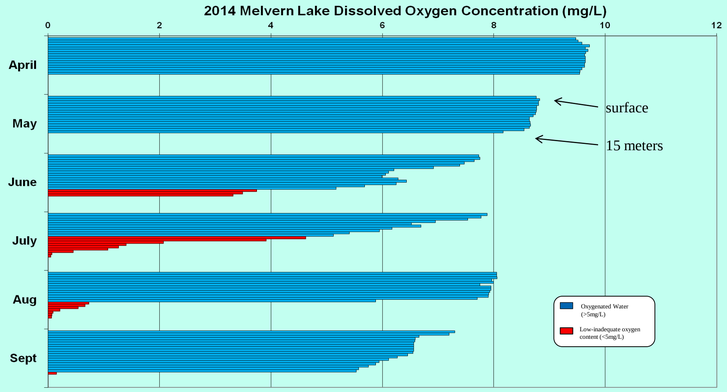
Median total nitrogen (TN) concentrations in 2014 from all Melvern Lake sample locations were near the bottom 25% of the 10-year TN data. With the exception of ME-2, median TN calculations in 2014 were all less than EPA Ecoregion recommended criteria of 0.661 mg/L. TN concentrations are highly variable between sites and years mostly related to inflow levels, watershed factors (i.e. soils, inflows, and farming practices), and in-lake biological processes. Total Nitrogen concentrations were below detection in April and May except at upper lake site ME-30. Inflows from January to April were 7% of historic average . Consequently, spring nutrient concentrations were low.





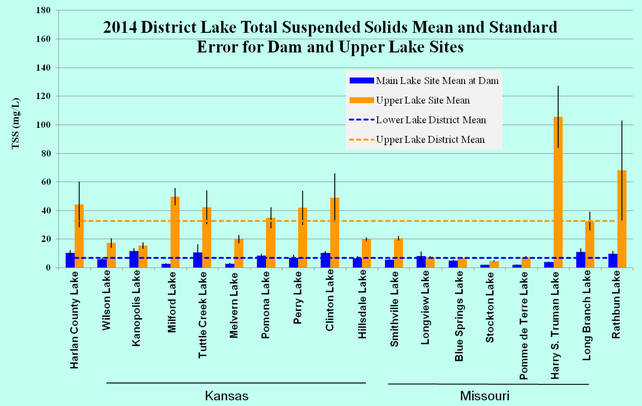
Dissolved Oxygen

Dissolved oxygen is a factor in aquatic species location, growth, and ultimately survival in lakes. The graph below shows dissolved oxygen measured in the water column in one-meter intervals (e.g. each row in each month represents one meter of depth) from April through September. Melvern Lake typically experiences weak stratification for a short period of the summer, however adequate (>5 mg/L) dissolved oxygen is typically available in the lake. In 2014, Melvern Lake was oxygenated in the top 10 meters throughout the summer.



Total Suspended Solids

Total suspended solids (TSS) or filterable solids in streams and lakes is a function of watershed characteristics including soil composition, land use, weather patterns, and characteristics of inflowing streams. TSS is an indicator of erosion in watersheds, sedimentation or filling rates of downstream reservoirs, and is also closely linked to nutrient and contaminant transport through river systems. In 2014, Melvern Lake TSS values at upper and lower lake sites were less than District lake averages. In 2014, 92% of TSS settled out of the water column as it moved from the upper lake to the dam.



Water Quality Concerns:

- Nutrients
- Sediment inputs

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